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Brief report: Associations of physical activity with anxiety and depression symptoms and status among adolescents

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ABSTRACT

The purpose of this study is to investigate associations between physical activity (PA), depression, and anxiety among adolescents in Ireland. Adolescents ($N = 481$; 281 male, 200 female) aged 15.1 ± 1.7 y self-reported PA level, depression, and anxiety. Approximately 21% of adolescents were high trait anxious, and ~37% reported scores indicating probable depression. Anxiety and depressive symptoms were higher for low PA (60 min/d, 0–2 d/wk) compared to moderate (60 min/d, 3–4 d/wk) and high (60 min/d, 5–7 d/wk) PA. After adjustment for relevant covariates, reduced odds of depression were 30% and 56% for moderate and high PA, respectively; reduced odds of high trait anxiety were 46% and 47% for moderate and high PA, respectively. These findings support the need for adolescents to engage in moderate PA, with potential for increased benefits with increased PA. To conclude, moderate and high PA are inversely associated with anxiety and depressive symptoms, and risk of depression and high trait anxiety in adolescents.

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Depression and anxiety are increasingly prevalent public health problems with limited treatment success. Following substance use disorders, anxiety (mean: 10.7%, IQR: 5.5%–14.9%) and depressive (mean: 6.1%, IQR: 3.1%–7.2%) disorders are the most prevalent psychiatric disorders in epidemiological studies providing estimates for adolescents aged 12–19 years (Costello, Copeland, & Angold, 2011). Similar prevalence rates have been reported among Irish adolescents (Dooley, Fitzgerald, & Giollabhui, 2015; Lynch, Mills, Daly, & Fitzpatrick, 2006); however, anxiety and depression have remained understudied in this population.

The benefits of physical activity for anxiety and depression are well-established in adult populations (Physical Activity Guidelines Advisory Committee, 2008). Physical activity may also reduce depression and anxiety in adolescents, with small-to-moderate effect sizes typically reported (Biddle & Asare, 2011). However, compared to adults, the association between physical activity and adolescent mental health has received significantly less attention. To the authors' knowledge this is the first study to examine relations of physical activity, anxiety, and depression among Irish adolescents.

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1. Method

The research protocol reported here was approved by the university ethics committee. Prior to data collection informed consent was obtained from school principals, participants' parents/carers, and participants. Data was collected between October and December 2015 from secondary schools (middle school/junior high/high school) in urban ($n = 6$) and rural ($n = 9$) areas across the four provinces of the Republic of Ireland. Seven schools were single-sex and eight were mixed-sex.

Target year groups, ranging from 1st to 6th year (ages 12 to 18), were identified within each school with the goal of achieving an equal distribution of age and sex. Potential participants within each target year group were then selected via a random number generator. Of the 900 students who were invited to participate, 481 (male = 281, female = 200) adolescents aged 15.1 ± 1.7 years provided data (53.4% response rate).

Physical activity level was measured by a modified version of the PACE + (Patient-Centred Assessment and Counselling for Exercise Plus Nutrition) adolescent physical activity measure (Prochaska, Sallis, & Long, 2001) which assessed the number of days each participant had accumulated 60 min of moderate and vigorous physical activity during the past seven days and for a typical week. The final score was a composite average of the two items. Participants were classified as low (0–2 days), moderate (3–4 days), or high (5 + days) physically active.

The trait subscale of the State-Trait Anxiety Inventory assessed trait anxiety (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983). Scores >50 indicated high trait anxiety status. Internal consistency was adequate in this sample ($\alpha = 0.87$). Depressive symptoms were assessed with the Quick Inventory of Depressive Symptomatology (Rush et al., 2003). Scores ≥ 6 indicated probable depression. Internal consistency was adequate in this sample ($\alpha = 0.79$).

Participants also provided information regarding variables which may influence the association of physical activity with anxiety and depression. Relevant participant characteristics and environmental variables included age, sex, body image, socioeconomic status, participant residence (rural/urban), and school type (all boys, all girls, mixed-sex).

Statistical analyses were conducted using SPSS Version 22.0 (Armonk, NY: IBM Corp.). One-way ANOVA followed by Bonferroni-corrected *post-hoc* tests quantified differences in anxiety and depressive symptoms between physical activity levels. Two-way ANOVAs followed by Bonferroni-corrected *post-hoc* tests examined variation in anxiety and depression according to physical activity level, sex, and their interaction. Binomial logistic regression quantified associations (i.e., crude and adjusted odds ratios) between physical activity level and high trait anxious status and probable depression. Covariates in adjusted models were age, sex, body image, socioeconomic status, participant residence, and school type.

2. Results

Participant characteristics are presented in Table 1. Trait anxiety scores were significantly higher among females ($F_{(1,472)} = 7.76, p \leq 0.006$); males were significantly more physically active ($F_{(1,474)} = 42.11, p < 0.001$).

Trait anxiety ($F_{(2,470)} = 10.33, p < 0.001$) and depressive symptoms ($F_{(2,426)} = 5.50, p \leq 0.004$) significantly differed by physical activity level. Significantly higher anxiety symptoms were reported for low physical activity (46.75 ± 8.88) compared to moderate ($42.57 \pm 9.11, p \leq 0.001$) and high ($40.23 \pm 10.47, p < 0.001$) physical activity levels. Depressive symptoms for low physical activity (6.8 ± 5.0) were significantly higher than the moderate ($5.4 \pm 3.6, p \leq 0.041$) and high ($5.0 \pm 4.8, p \leq 0.007$)

Table 1
Participant characteristics.

	Male (n = 281)	Female (n = 200)	Total (n = 481)
Age (mean (SD))	15.0 (1.6)	15.3 (1.7)	15.1 (1.7)
Body Image Score (6–24) ^c	17.87	15.37	16.84
Residence (%) ^a			
Town/city	37.2	28.1	33.4
Village/countryside	62.8	71.9	66.6
Participants by School Type (%) ^c			
Male-only School	60.4	0.0	35.2
Female-only School	0.0	29.5	12.3
Mixed	39.6	70.5	52.5
Trait Anxiety (mean (SD)) ^b	41.5 (9.9)	44.1 (9.6)	42.6 (9.9)
High Trait Anxious (n (%))	48 (24.0)	55 (19.6)	103 (21.4)
QIDS (mean (SD))	5.5 (4.8)	5.7 (3.8)	5.6 (4.4)
Mild (n (%))	58 (20.6)	62 (31.0)	120 (24.9)
Moderate (n (%))	30 (10.7)	15 (7.5)	45 (9.4)
Severe (n (%))	9 (3.2)	1 (0.5)	10 (2.1)
Very severe (n (%))	3 (1.1)	1 (0.5)	4 (0.8)
Physical Activity Level ^c			
Low (n (%))	48 (17.1)	59 (29.5)	107 (22.2)
Moderate (n (%))	95 (33.8)	107 (53.5)	202 (42.0)
High (n (%))	133 (47.3)	34 (17.0)	167 (34.7)

^a $p < 0.05$ ^b $p < 0.01$ ^c $p < 0.001$ for differences between males and females.

Abbreviations: QIDS: Quick Inventory of Depressive Symptomatology.

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